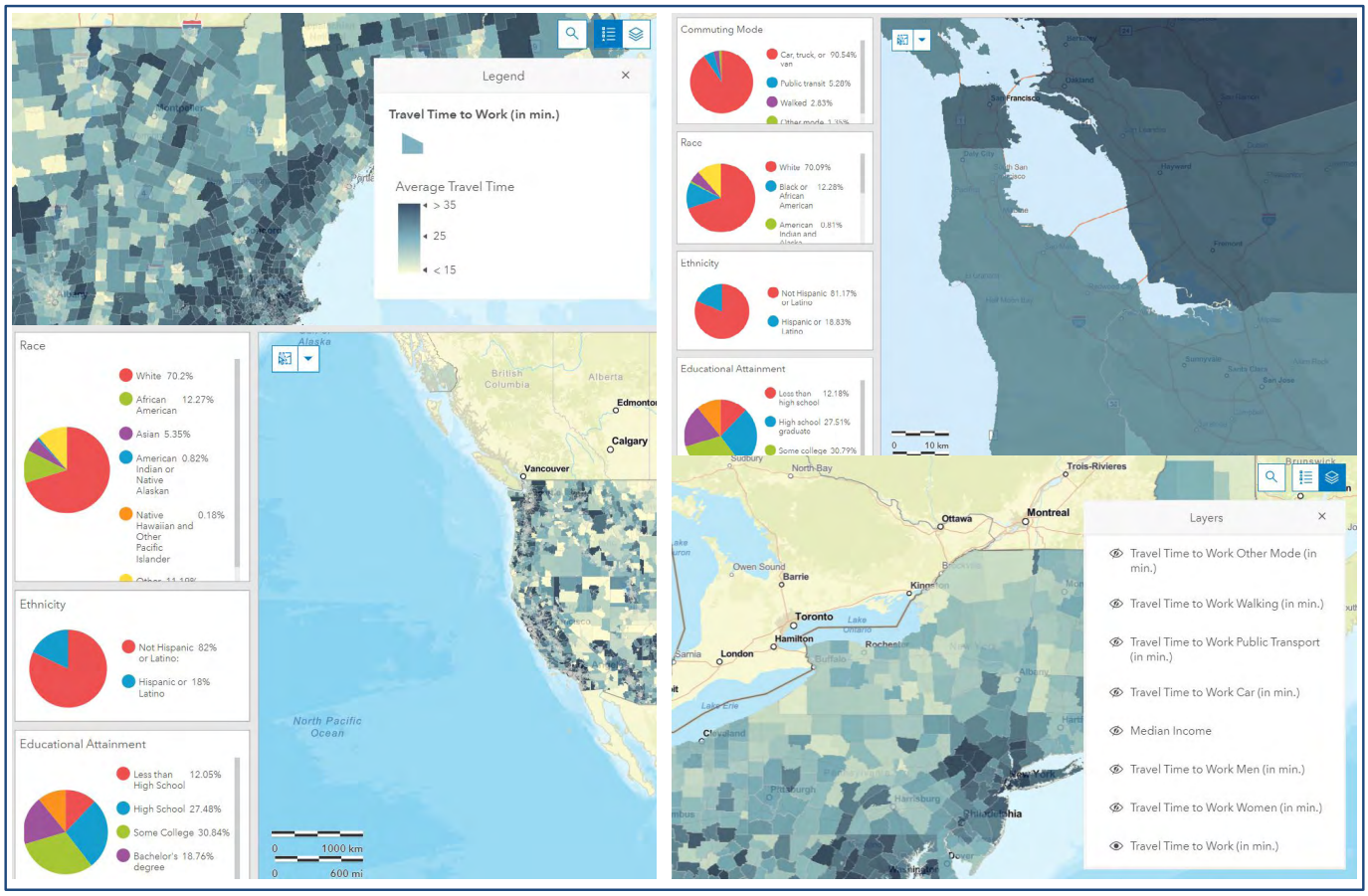
SJSU SAN JOSÉ STATE UNIVERSITY

MTI MINETA TRANSPORTATION INSTITUTE

Commute Duration Dashboard Guide: Mapping Commute Travel Times to Evaluate Accessibility

Project 2064
July 2021

Todd Litman, Hilary Nixon, PhD, and Cameron Simons



The Commute Duration Mapping System *allows users to see and compare commute duration and related information for most U.S. communities. This guide describes how to use its dashboard.*

Why Measure Commute Duration

Transportation planning is shifting from *mobility-based* to *accessibility-based* analysis (Herriges 2018). Mobility-based planning evaluates transportation system performance based primarily on travel *speed*. Accessibility-based planning evaluates system performance based on *time*, the amount of time required to access desired services and activities such as work, school and shops. Accessibility-based planning recognizes that many factors can affect accessibility, including *mobility* (travel speed), *proximity* (the distances between destinations, and therefore development density and mix), transport system diversity (the variety of travel modes available at a time and place), transport network *connectivity* (the quality of connections between modes), and affordability

(people's ability to pay for transport infrastructure and services). It recognizes the value of slower modes – walking, bicycling and public transit – and of compact, multimodal development, in providing efficient and equitable transportation. Accessibility-maximizing planning, which optimizes all of these factors, is called "Smart Growth," "Location Efficient Development," or "15-minute neighborhoods." (Duany and Steuteville 2021)

Accessibility-based planning can be challenging (Proffitt, et al. 2019). Mobility is relatively easy to measure, accessibility less so. For example, transportation engineers can produce color-coded maps showing roadway congestion and traffic speeds. Such maps are easy to understand, and can be persuasive, justifying roadway expansions to reduce congestion and increase traffic speeds. In recent years, transportation planners have developed better tools for measuring and mapping accessibility. These include indicators such as Walk Score and Transit Score, and multimodal accessibility maps which use color codes to show the number of activities (shops, job, school, parks, etc.) that can be reached within a given travel time. These can help guide planning to create more accessible communities.

Accessibility mapping systems can be useful for many types of planning. For example, they can help determine which home or business location provides better accessibility, and therefore economic opportunity. This information can also be used for research purposes, for example, to determine how transportation and land use conditions affects accessibility.

A simple but useful accessibility indicator is *trip duration*, the amount of time that people spend traveling to destinations. Commute duration data—the number of minutes that workers spend traveling to their jobs—is available in the United States from the U.S. Census. Our *Commute Duration Mapping* website presents this and related information for most U.S. communities. This guide provides an overview of this mapping system's controls.

Using the Commute Duration Dashboard

Our team used ArcGIS Online to develop two publicly-accessible portals to visualize U.S. commuting data at different geographic scales. We call their user interfaces *dashboards*. The mapping system uses the U.S. Census Bureau's *American Community Survey* 2015-2019 Five-Year sample data obtained from IPUMS (Ruggles et al., 2021). The two portals present this information at different geographic scales, providing a range of data, some of which is available at different geographic scales.

Here are instructions for navigating the dashboards.

County Commute Duration Dashboard

The County Commute Duration Dashboard (see Figure 1) presents data at the County level and includes information about the breakdown of commuting by mode, as well as racial, ethnical, and educational attainment statistics. This is a *choropleth* or *heat map*, which means that information is color coded. The dashboard initially shows the continental US, with pie charts on the left side of the screen reporting national level statistics. The map defaults to average travel time to work at the county level.

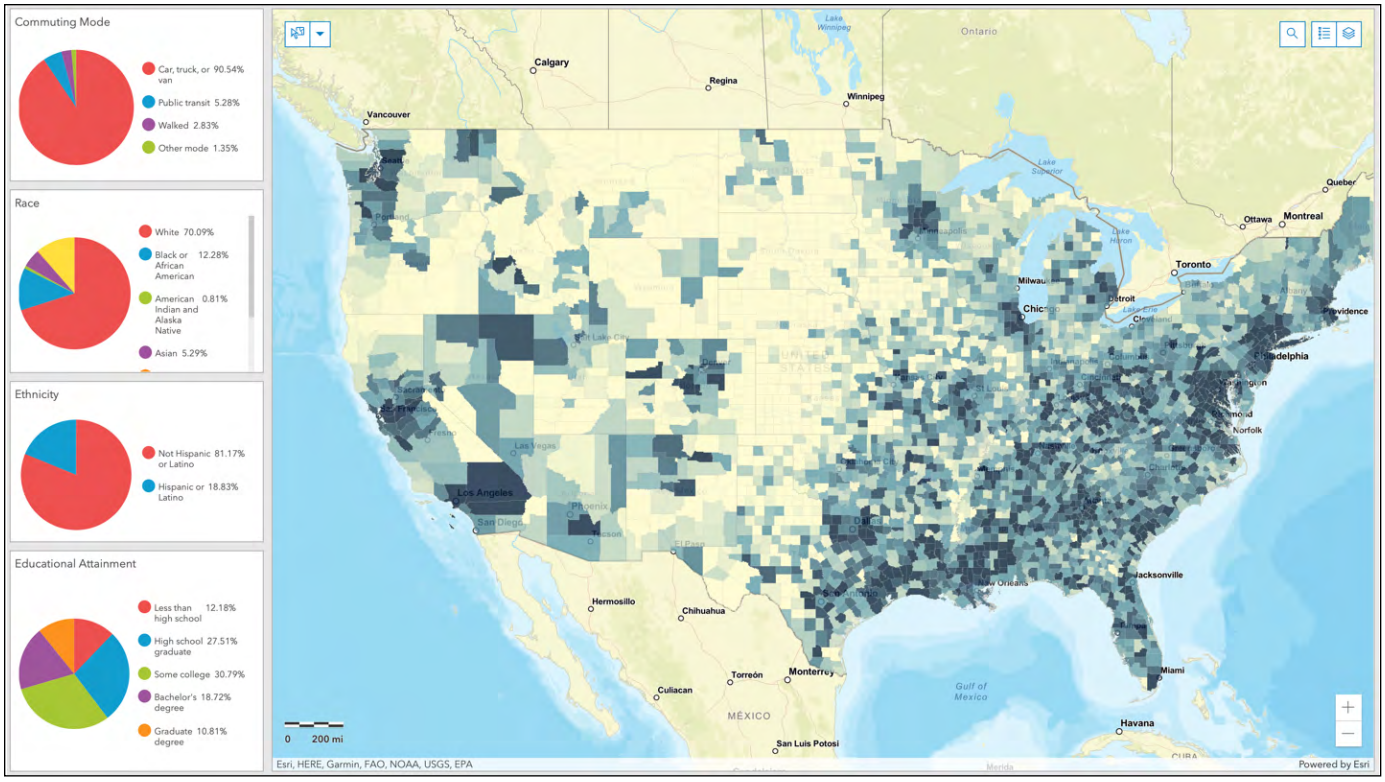


Figure 1. County Commute Duration Dashboard, start-up view. This choropleth map shows data with adjustable color codes.

Users can navigate to different geographic areas by zooming in/out using the + and – buttons at the bottom left, use the search/magnifying glass button in the upper right to zoom to a specific address, or use a mouse/track pad to scroll around the map. A legend showing the details for the choropleth map can be accessed by clicking the legend button in the upper right (see Figure 2).

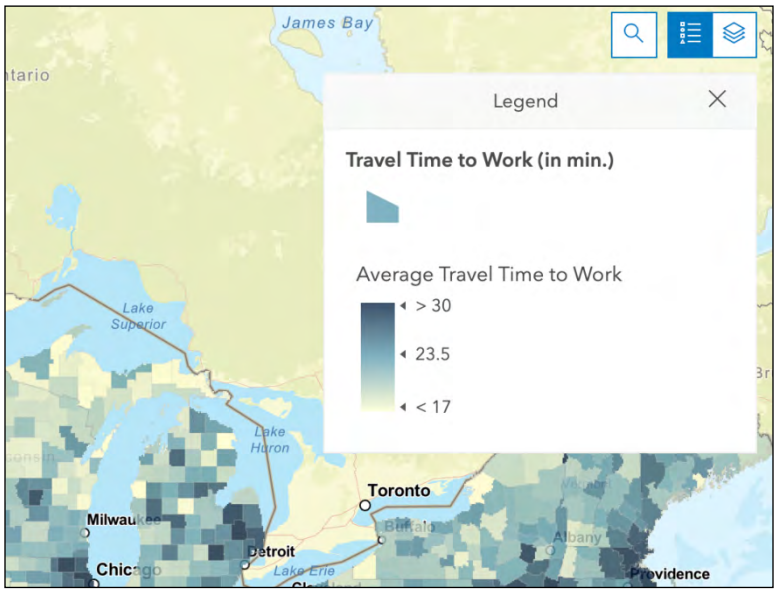


Figure 2. Legend for choropleth map details

Statistics about commute duration can be obtained by clicking on a county in the map, which will bring up a pop-up window (see Figure 3) with about that county (or counties if multiple geographies are selected). The default data shown is average travel time, in minutes, for all workers as well as the number of workers over 18.

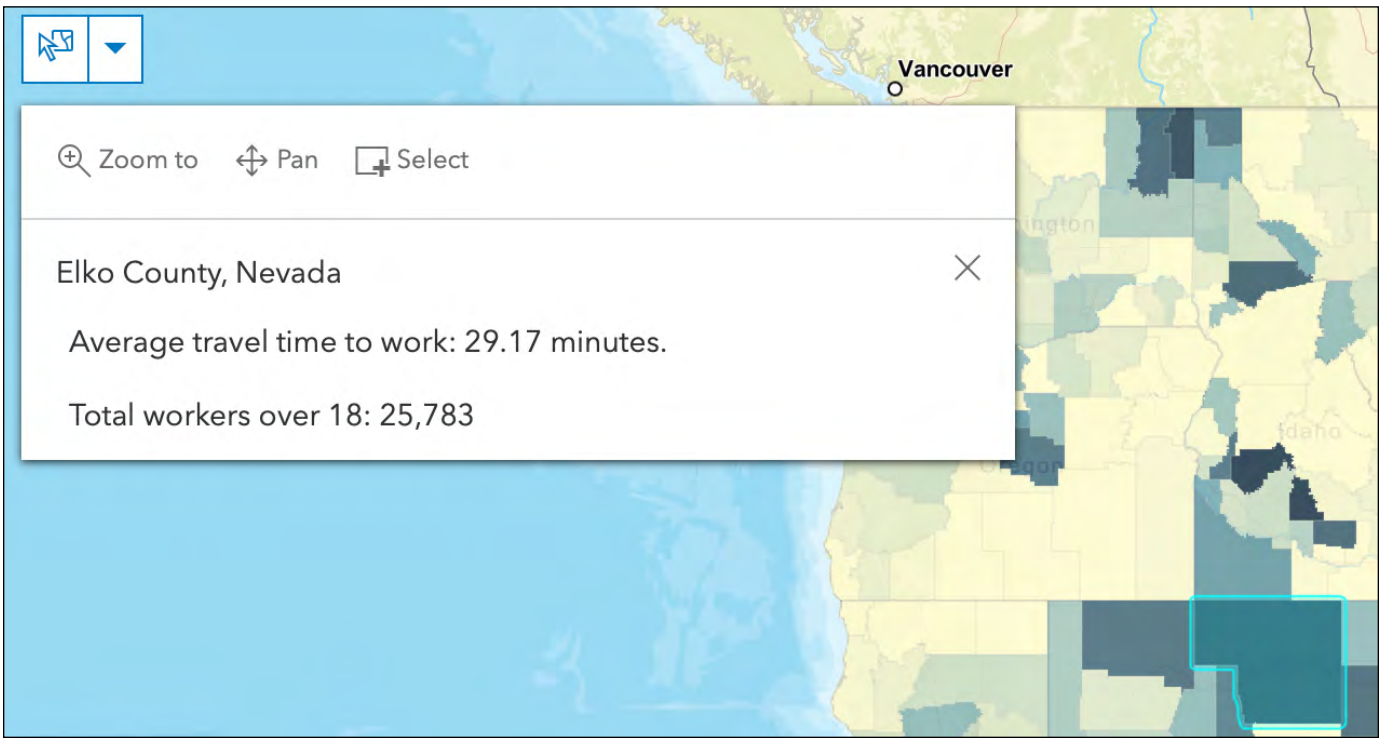


Figure 3. Example of pop-up window showing commute duration statistics for Elko County, Nevada

Users can change the data shown in the pop-up window by selecting different layers through the button on the upper right (see Figure 4). Multiple data pieces can be selected, but these will show up in separate pop-up windows that a user will need to navigate through, not in a single pop-up.

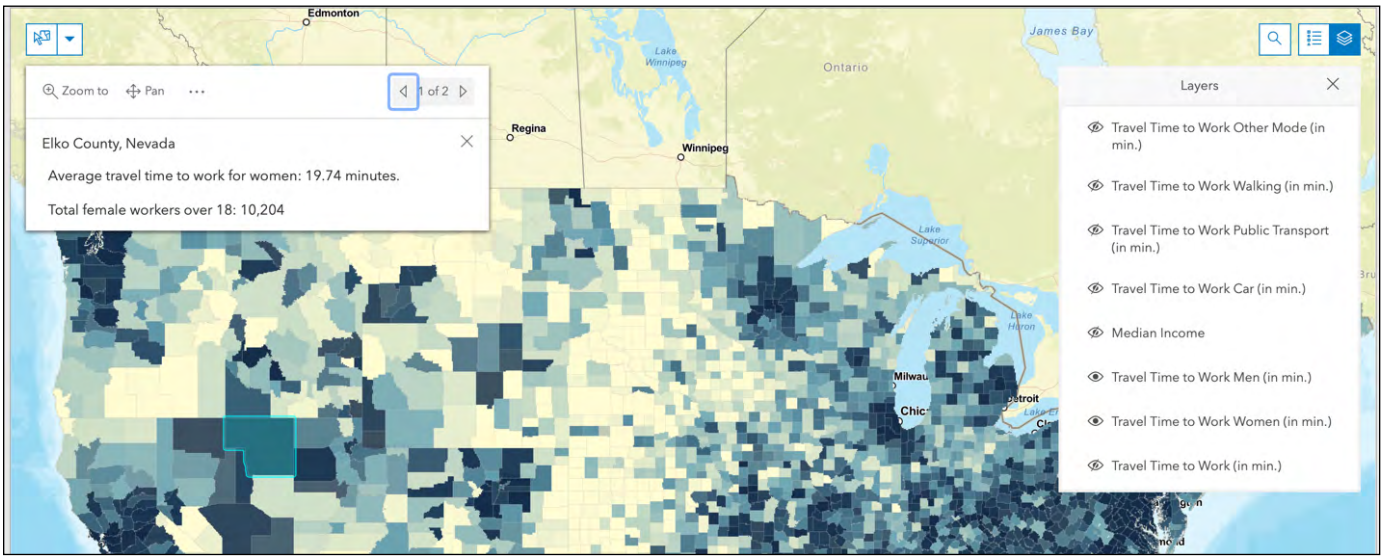


Figure 4. Data layers (on right) and pop-up window (on left) showing different data layer

The default information presented in the pie charts on the left side of the dashboard are national level statistics. To change the information presented in the charts, activate the data view button at the upper left of the map display. When this button is clicked, it will turn blue and be activated (see Figure 5).

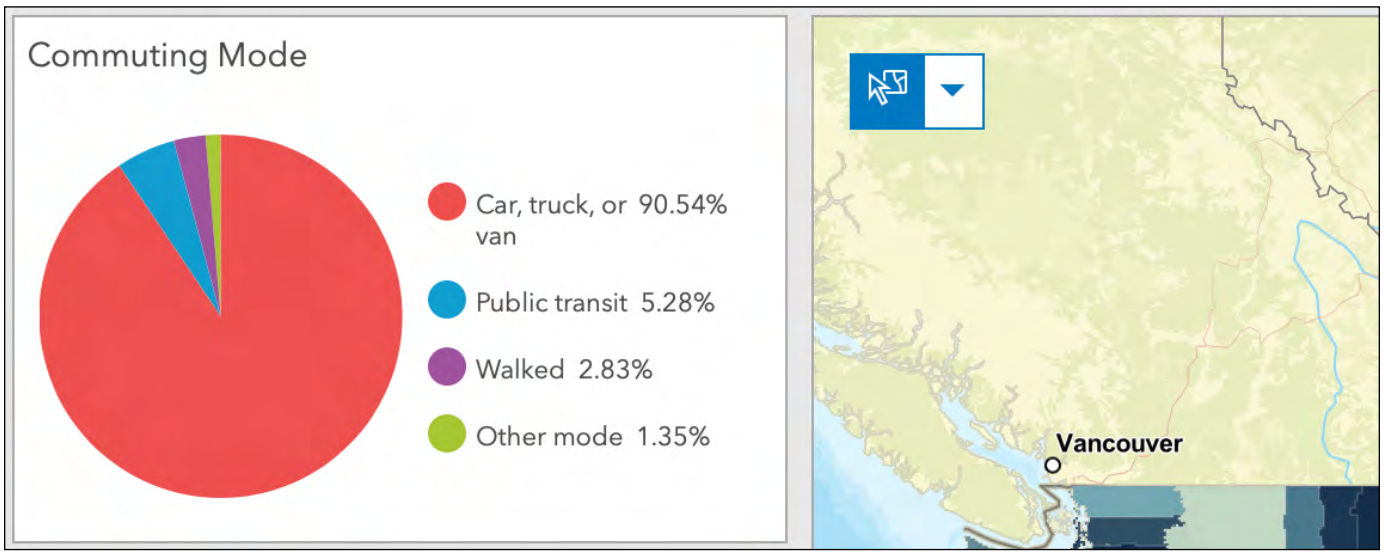


Figure 5. Changing the data view for pie charts by activating the view button

With the data view button activated (blue), when a user selects a county (or group of counties), the data in the pie charts will now present the data for the selected geographies (see Figure 6).

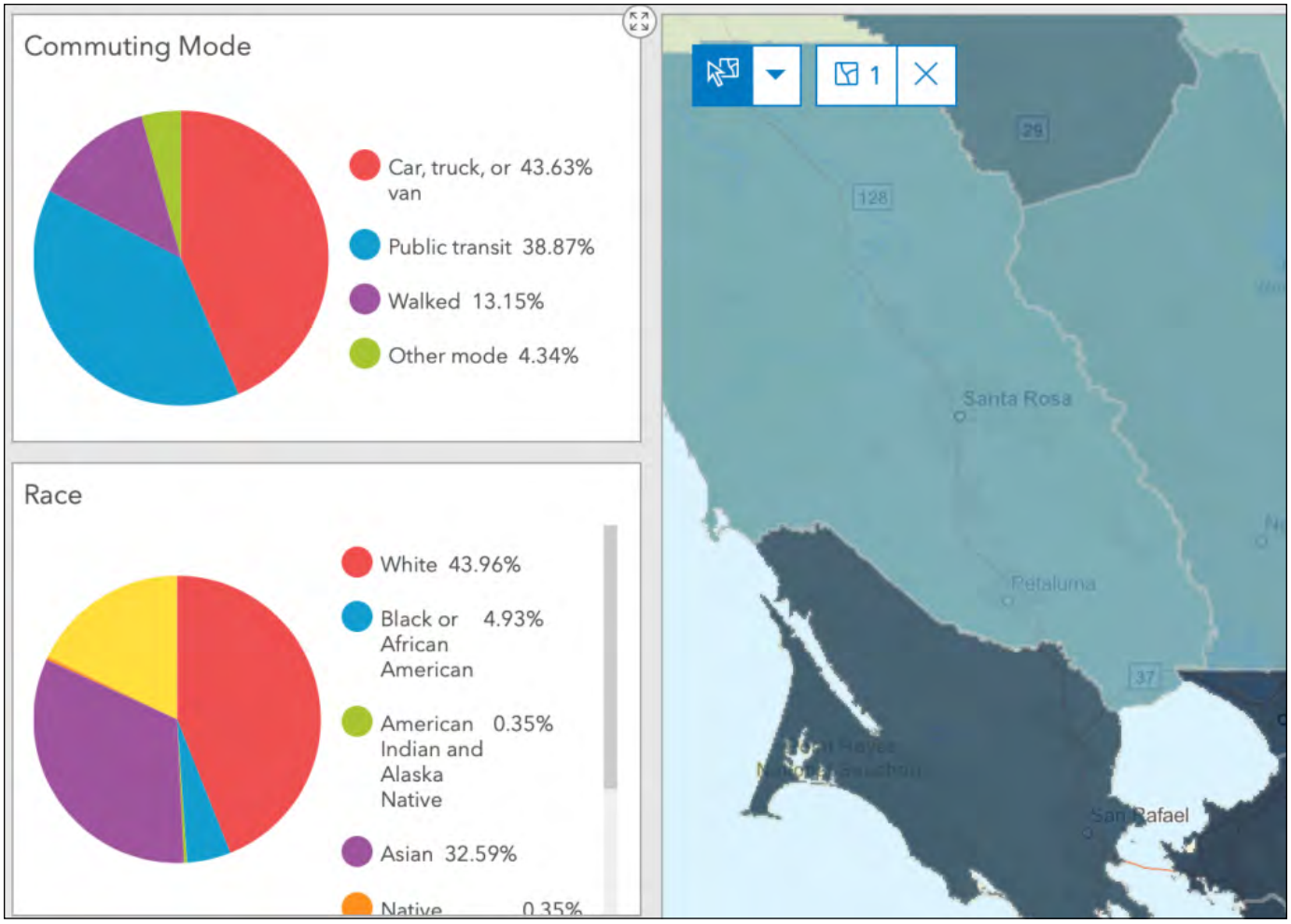


Figure 6. Example showing the pie chart data updated for San Francisco County

Census Tract Commute Duration Dashboard

The Census Tract Commute Dashboard (see Figure 7) functions in a similar manner to the County Commute Dashboard. Users navigate around the map using the same approach and change the data shown in the pop-up windows and pie charts using the same process. The primary difference between the two dashboards is the geographic scale with this dashboard presenting census tract level information. In addition, due to data limitations, commute mode data is not available for this dashboard.

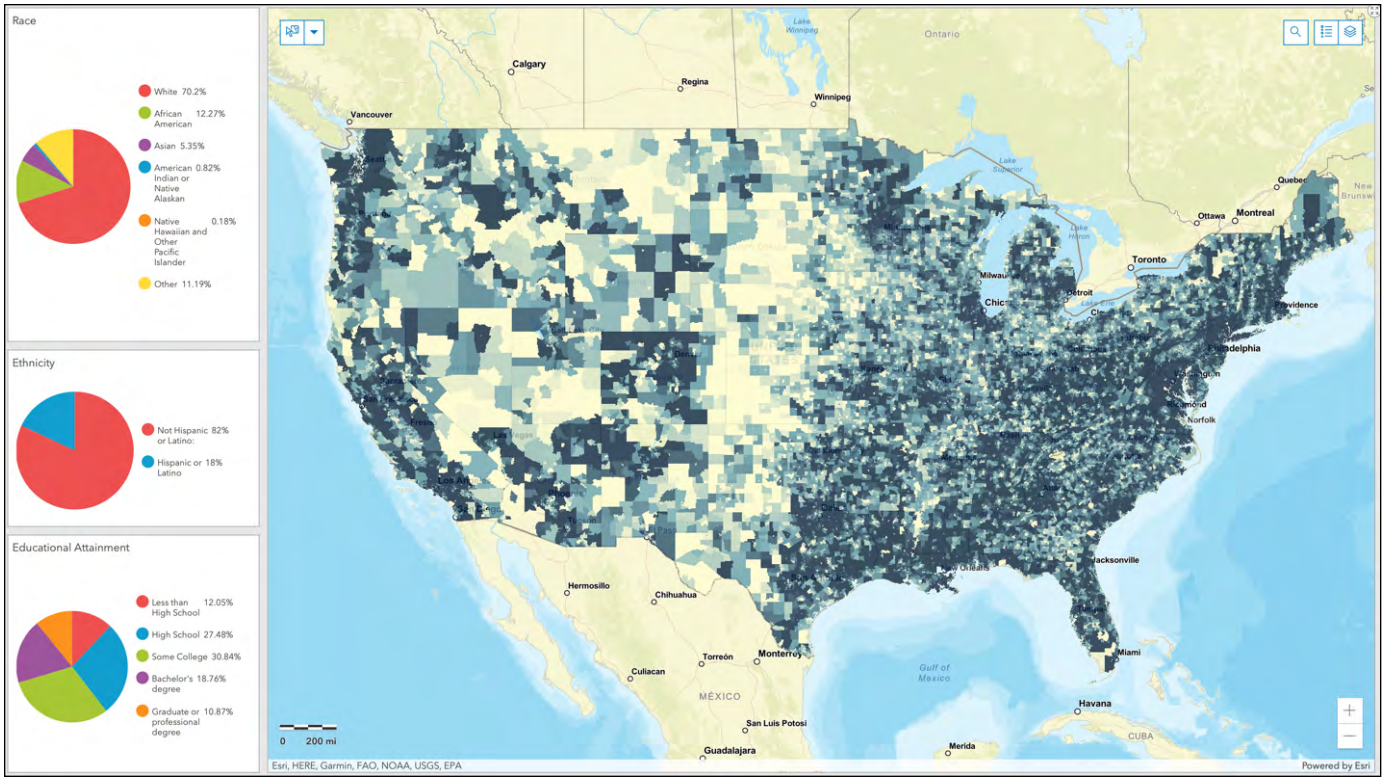


Figure 7. Census Track Commute Dashboard, start-up view

References and Information Resources

Accessibility Observatory (http://ao.umn.edu) is a resource for the research and application of accessibility-based transportation system evaluation.

Andres Duany and Robert Steuteville (2021), *Defining the 15-minute City*, Public Square (www.cnu.org); at www.cnu.org/publicsquare/2021/02/08/defining-15-minute-city.

Daniel Herriges (2018), *The Difference Between Mobility and Accessibility*, Strong Towns (www.strongtowns.org); at www.strongtowns.org/journal/2018/10/17/the-difference-between-mobility-and-accessibility.

ITF (2019), *Benchmarking Accessibility in Cities: Measuring the Impact of Proximity and Transport Performance*, Paper 68, International Transport Forum (www.itf-oecd.org); at https://bit.ly/2VqvgvK.

ITF (2020), *Accessibility and Transport Appraisal*, International Transport Forum (www.itf-oecd.org); at www.itf-oecd.org/accessibility-and-transport-appraisal.

Kevin Kane, Jae Hong Kim and John R. Hipp (2017), *What Makes Housing Accessible to Everyday Destinations in Southern California?* Metropolitan Futures Initiative (http://mfi.soceco.uci.edu); at http://mfi.soceco.uci.edu/files/2017/04/UCi17_MFI_Report5_v2.pdf.

Jonathan Levine, et al. (2012), "Does Accessibility Require Density or Speed?" *Journal of the American Planning Association*, Vol. 78, No. 2, pp. 157-172, http://dx.doi.org/10.1080/01944363.2012.677119; at http://tinyurl.com/cpdmmf6. Also see *Metropolitan Accessibility: Comparative Indicators for Policy Reform* (www.umich.edu/~umaccess).

David Levinson and David King (2020), *Transport Access Manual: A Guide for Measuring Connection between People and Places*, Committee of the Transport Access Manual, University of Sydney (https://ses.library.usyd.edu.au); at https://hdl.handle.net/2123/23733.

David M. Levinson, Wes Marshall and Kay Axhausen (2018), *Elements of Access: Transport Planning for Engineers, Transport Engineering for Planners*, Transportist (https://transportist.org); at https://transportist.org/books/elements-of-access.

Chris Lightfoot and Tom Steinberg (2006), *Travel-time Maps and Their Uses*, My Society (www.mysociety.org/2006/travel-time-maps/index.php). This website describes how 'Travel-time Maps' can be used to indicate the time needed to travel to various destinations.

Opportunity Score (https://labs.redfin.com/opportunity-score) ranks locations in 350 U.S. cities based on the number of jobs that can be accessed within a 30-minute walk or transit ride.

David G. Proffitt, et al. (2019), "Accessibility Planning in American Metropolitan Areas: Are We There Yet? *Urban Studies*, Vol. 56(1), pp. 167-192 (https://doi.org/10.1177/0042098017710122).

Steven Ruggles, et al. (2021), IPUMS USA: Version 11.0, American Community Survey 2015-2019, 5-Year Sample. Minneapolis, MN: IPUMS (https://doi.org/10.18128/D010.V11.0).

Smart Location Mapping (www.epa.gov/smartgrowth/smart-location-mapping) provides interactive maps for measuring location efficiency, including access to jobs and services, and per capita vehicle travel.

Spatial Network Analysis For Multi-Modal Urban Transport Systems (www.snamuts.com) evaluates the accessibility of a region's current public transport network.

Eric Sundquist, Chris McCahill and Michael Brenneis (2021), *Measuring Accessibility: A Guide for Transportation and Land Use Practitioners*, State Smart Transportation Initiative (https://ssti.us); at https://ssti.us/2021/01/27/ssti-releases-practitioner-guide-to-measuring-accessibility.

Urban Accessibility Explorer (http://urbanaccessibility.com) is an easy-to-use mapping system that measures the number of jobs and services that can be reached in a given time period, by a particular mode and time of day in the Chicago Metropolitan area.

About the Authors

Todd Litman

Todd Litman is founder and executive director of the Victoria Transport Policy Institute, an independent research organization dedicated to developing innovative solutions to transport problems. His work helps expand the range of impacts and options considered in transportation decision-making, improve evaluation methods, and make specialized technical concepts accessible to a larger audience. His research is used worldwide in transport planning and policy analysis.

Hilary Nixon, PhD

Dr. Nixon is Deputy Executive Director of the Mineta Transportation Institute and a faculty member in the MS Transportation Management program at San José State University. She specializes in transportation and environmental planning and policy, and her research focuses primarily on the factors that influence pro-environmental behavior and the relationship between transportation and the environment. She earned a BA from the University of Rochester and a PhD in Planning, Policy and Design from the University of California, Irvine.

Cameron Simons

Cameron Simons is a Housing Data Analyst at Kukun. He previously worked for the City of San José's Department of Transportation and as a Research Assistant for the Mineta Transportation Institute. He holds a MS in Data Science and a BS in Economics from San José State University.

MTI is a University Transportation Center sponsored by the U.S. Department of Transportation's Office of the Assistant Secretary for Research and Technology and by Caltrans. The Institute is located within San José State University's Lucas Graduate School of Business.

This report can be accessed at
transweb.sjsu.edu/research/2064